



PMZB290UN

20 V, single N-channel Trench MOSFET

20 January 2016

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Fast switching
- Trench MOSFET technology
- Low threshold voltage
- Ultra thin package profile with 0.37 mm height
- ElectroStatic Discharge (ESD) protection: 2 kV HBM

3. Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

4. Quick reference data

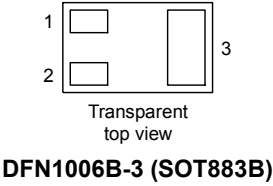
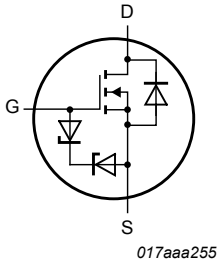
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
V_{GS}	gate-source voltage		-8	-	8	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	1	A
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 200\text{ mA}; T_j = 25\text{ °C}$	-	290	350	m Ω

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm².

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>Transparent top view DFN1006B-3 (SOT883B)</p>	 <p>017aaa255</p>
2	S	source		
3	D	drain		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB290UN	DFN1006B-3	DFN1006B-3: leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

7. Marking

Table 4. Marking codes

Type number	Marking code
PMZB290UN	0000 0101

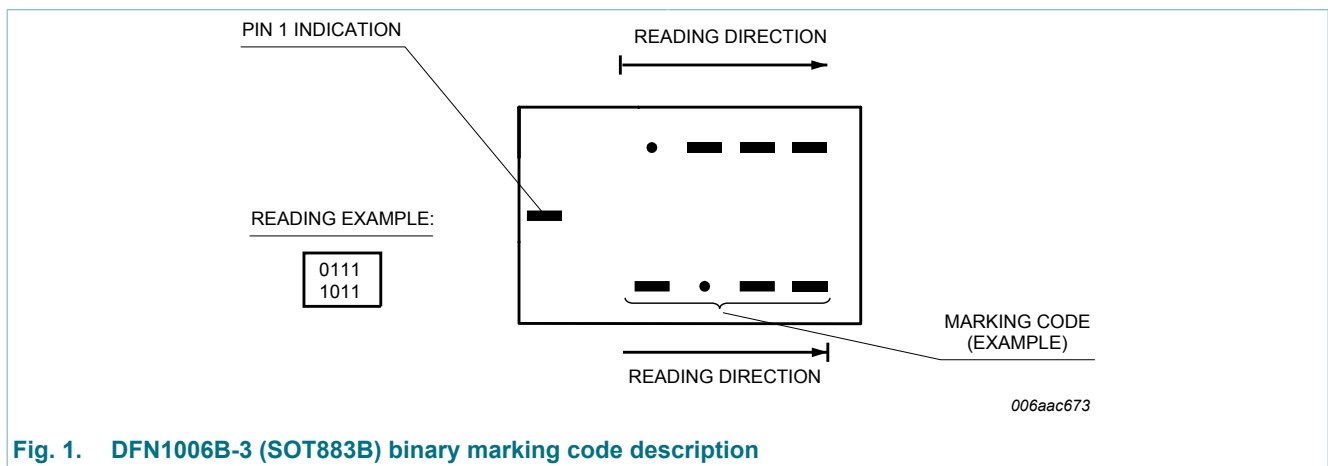


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	20	V
V _{GS}	gate-source voltage			-8	8	V
I _D	drain current	V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	1	A
		V _{GS} = 4.5 V; T _{amb} = 100 °C	[1]	-	0.6	A
I _{DM}	peak drain current	T _{amb} = 25 °C; single pulse; t _p ≤ 10 μs		-	4	A
P _{tot}	total power dissipation	T _{amb} = 25 °C	[2]	-	360	mW
			[1]	-	715	mW
		T _{sp} = 25 °C		-	2700	mW
T _j	junction temperature			-55	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C
Source-drain diode						
I _S	source current	T _{amb} = 25 °C	[1]	-	0.67	A

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm².
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

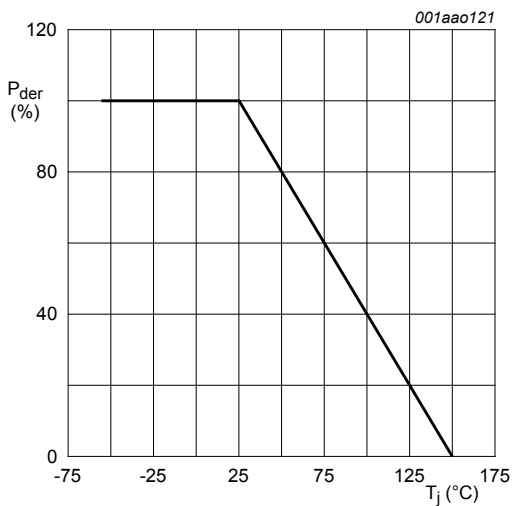


Fig. 2. Normalized total power dissipation as a function of junction temperature

$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ\text{C})}} \times 100\%$$

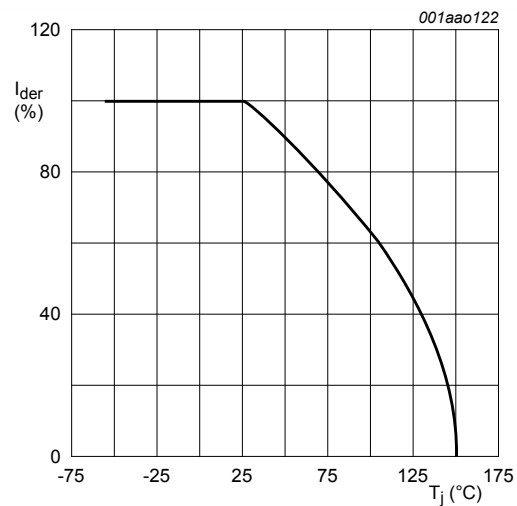
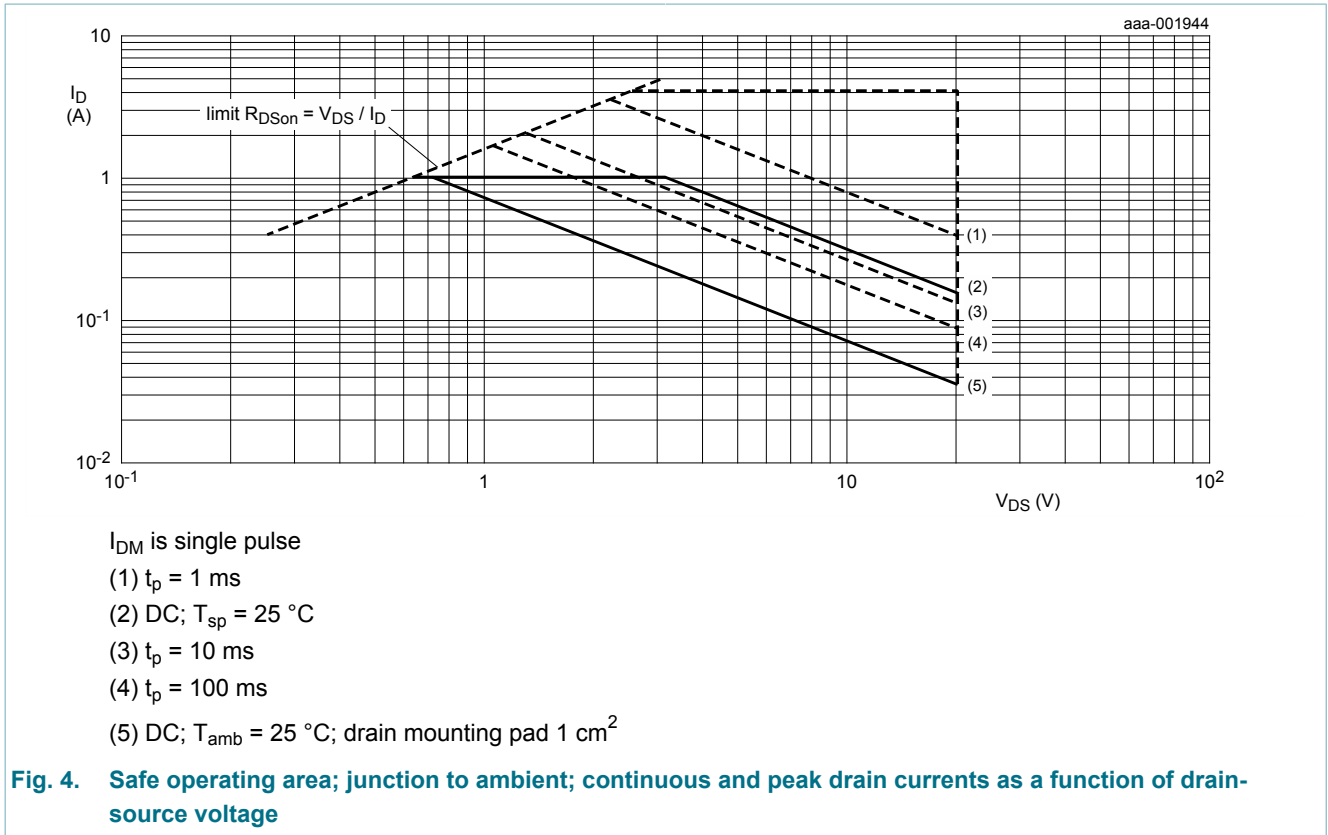


Fig. 3. Normalized continuous drain current as a function of junction temperature

$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	305	360	K/W
			[2]	-	150	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	40	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain 1 cm^2 .

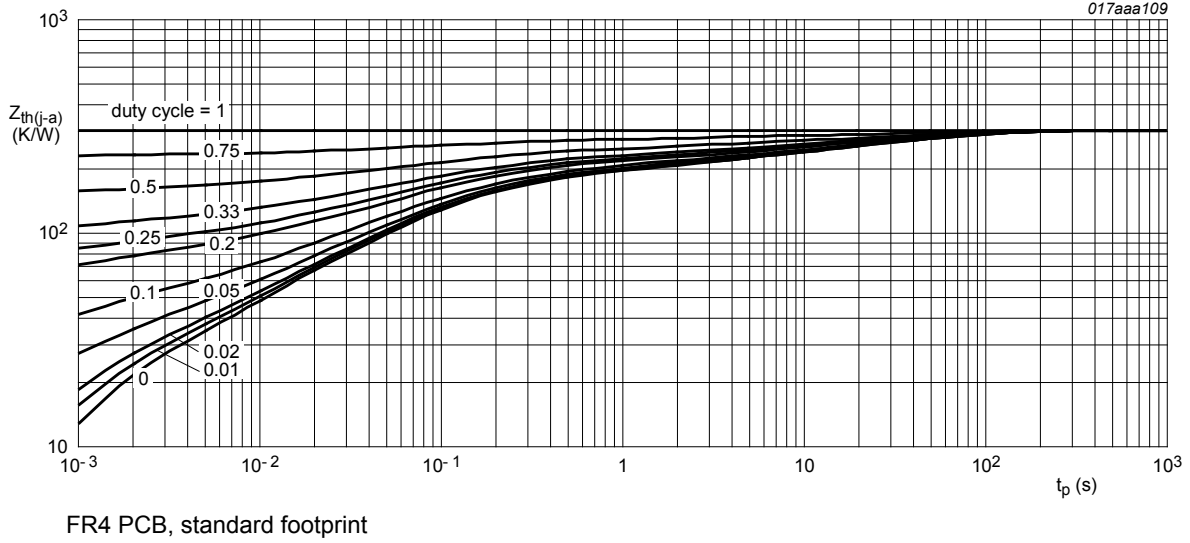


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

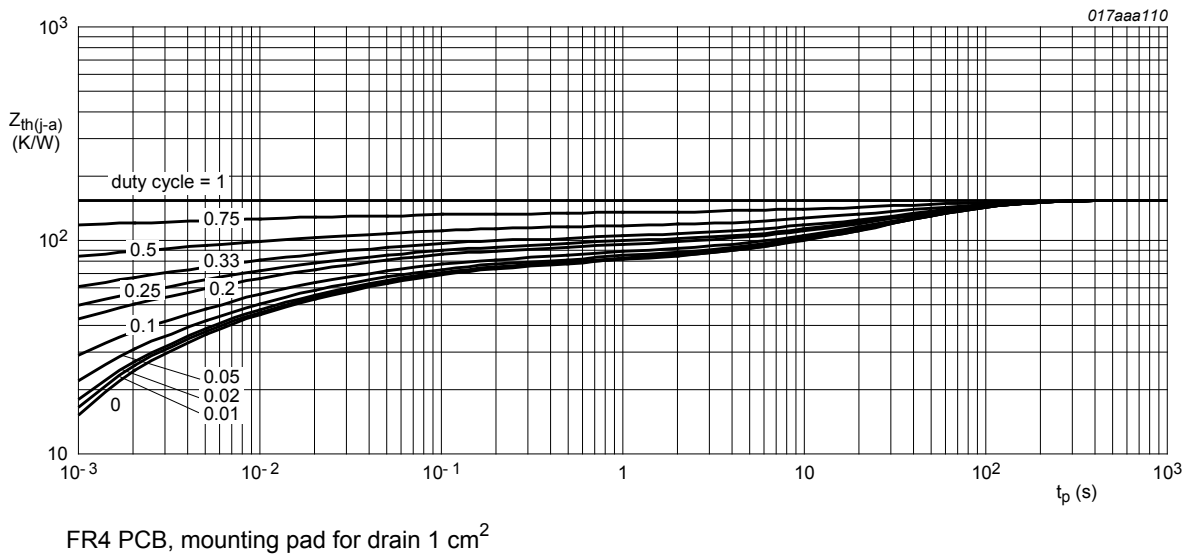
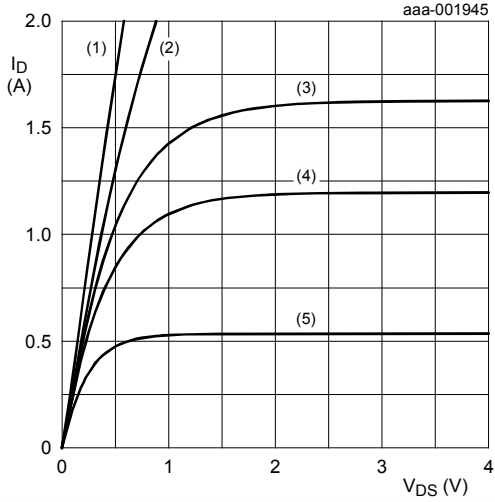


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10 \mu A$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	20	-	-	V
V_{GSth}	gate-source threshold voltage	$I_D = 250 \mu A$; $V_{DS} = V_{GS}$; $T_j = 25 \text{ }^\circ C$	0.45	0.7	0.95	V
I_{DSS}	drain leakage current	$V_{DS} = 20 V$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{DS} = 20 V$; $V_{GS} = 0 V$; $T_j = 150 \text{ }^\circ C$	-	-	100	μA
I_{GSS}	gate leakage current	$V_{GS} = 8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	5	μA
		$V_{GS} = -8 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-5	μA
		$V_{GS} = 4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	1	μA
		$V_{GS} = -4.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-1	μA
		$V_{GS} = 2.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = -2.5 V$; $V_{DS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	-	-100	nA
		$V_{GS} = 4.5 V$; $I_D = 200 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	290	350	m Ω
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5 V$; $I_D = 200 \text{ mA}$; $T_j = 150 \text{ }^\circ C$	-	460	560	m Ω
		$V_{GS} = 2.5 V$; $I_D = 100 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	360	450	m Ω
		$V_{GS} = 1.8 V$; $I_D = 75 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	460	650	m Ω
		$V_{GS} = 4.5 V$; $I_D = 200 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	5.8	-	S
g_{fs}	forward transconductance	$V_{DS} = 5 V$; $I_D = 200 \text{ mA}$; $T_j = 25 \text{ }^\circ C$	-	5.8	-	S
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V$; $I_D = 1 A$; $V_{GS} = 4.5 V$; $T_j = 25 \text{ }^\circ C$	-	0.89	1.2	nC
Q_{GS}	gate-source charge		-	0.13	-	nC
Q_{GD}	gate-drain charge		-	0.18	-	nC
C_{iss}	input capacitance	$V_{DS} = 20 V$; $f = 1 \text{ MHz}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	45	68	pF
C_{oss}	output capacitance		-	11	-	pF
C_{rss}	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V$; $R_L = 10 \Omega$; $V_{GS} = 4.5 V$; $R_{G(ext)} = 6 \Omega$; $T_j = 25 \text{ }^\circ C$	-	4.5	9	ns
t_r	rise time		-	10	-	ns
$t_{d(off)}$	turn-off delay time		-	18.5	37	ns
t_f	fall time		-	5	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 300 \text{ mA}$; $V_{GS} = 0 V$; $T_j = 25 \text{ }^\circ C$	-	0.75	1.2	V



$T_j = 25\text{ }^\circ\text{C}$
 (1) $V_{GS} = 4.5\text{ V}$
 (2) $V_{GS} = 2.5\text{ V}$
 (3) $V_{GS} = 2.0\text{ V}$
 (4) $V_{GS} = 1.8\text{ V}$
 (5) $V_{GS} = 1.5\text{ V}$

Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values

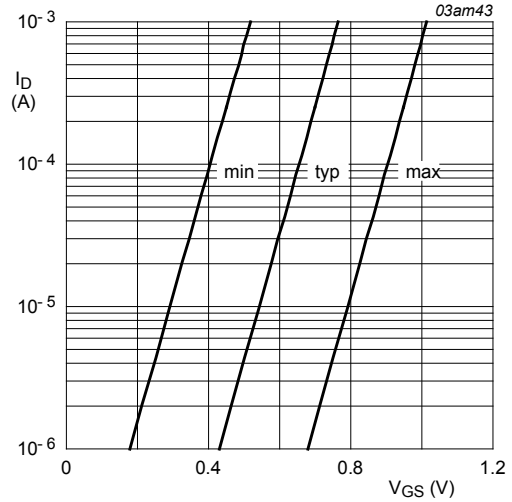
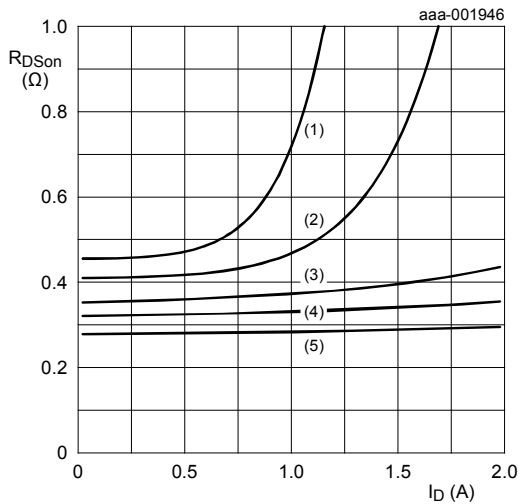


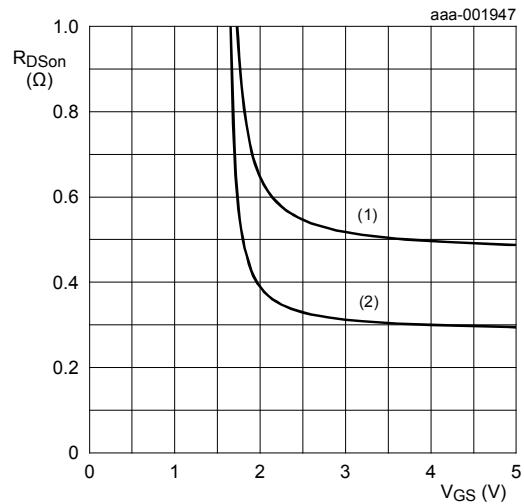
Fig. 8. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$



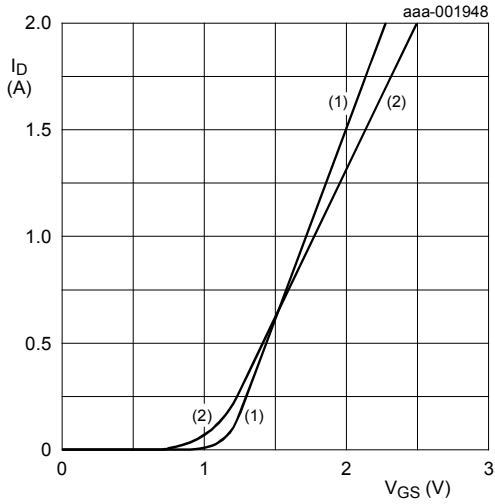
$T_j = 25\text{ }^\circ\text{C}$
 (1) $V_{GS} = 1.8\text{ V}$
 (2) $V_{GS} = 2\text{ V}$
 (3) $V_{GS} = 2.5\text{ V}$
 (4) $V_{GS} = 3\text{ V}$
 (5) $V_{GS} = 4.5\text{ V}$

Fig. 9. Drain-source on-state resistance as a function of drain current; typical values



$I_D = 800\text{ mA}$
 (1) $T_j = 150\text{ }^\circ\text{C}$
 (2) $T_j = 25\text{ }^\circ\text{C}$

Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values



$V_{DS} > I_D \times R_{DSon}$
 (1) $T_j = 25\text{ °C}$
 (2) $T_j = 150\text{ °C}$

Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values

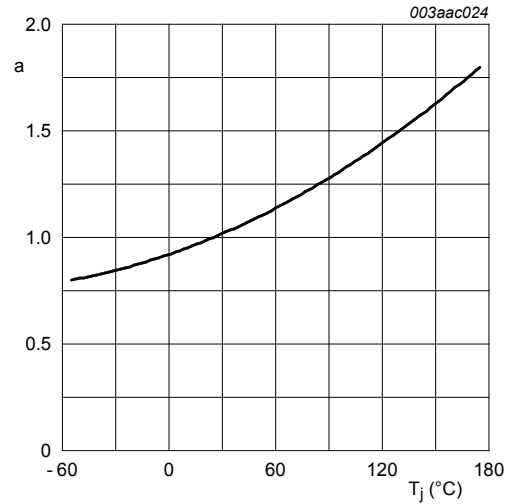
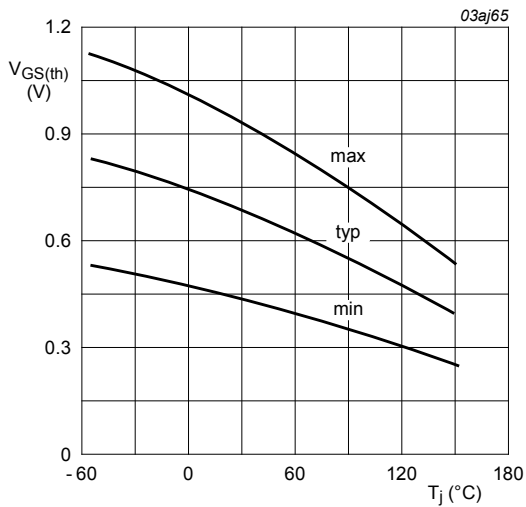


Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values

$$a = \frac{R_{DSon}}{R_{DSon(25\text{°C})}}$$



$I_D = 0.25\text{ mA}; V_{DS} = V_{GS}$

Fig. 13. Gate-source threshold voltage as a function of junction temperature

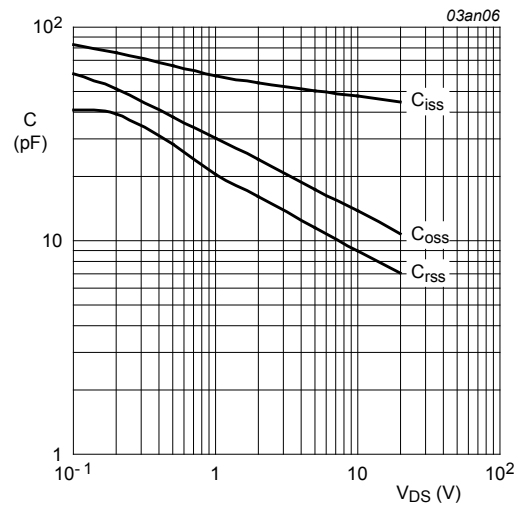


Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

$V_{GS} = 0V; f = 1MHz$

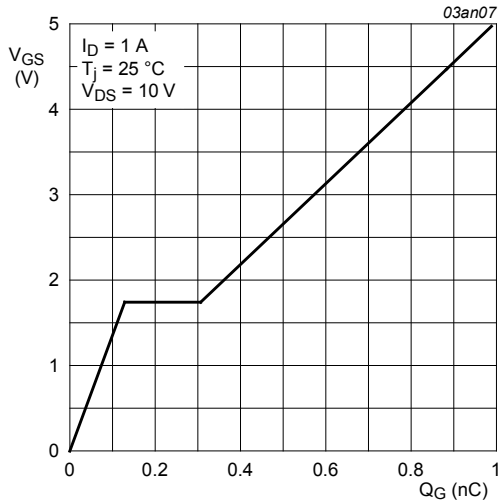


Fig. 15. Gate-source voltage as a function of gate charge; typical values

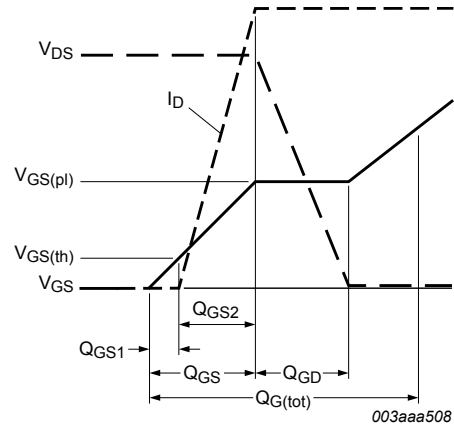
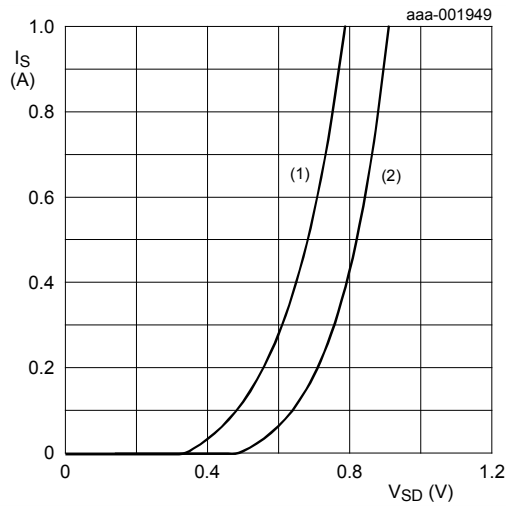


Fig. 16. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$
 (1) $T_j = 150\text{ °C}$
 (2) $T_j = 25\text{ °C}$

Fig. 17. Source current as a function of source-drain voltage; typical values

11. Test information

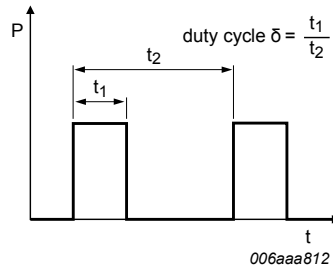


Fig. 18. Duty cycle definition

12. Package outline

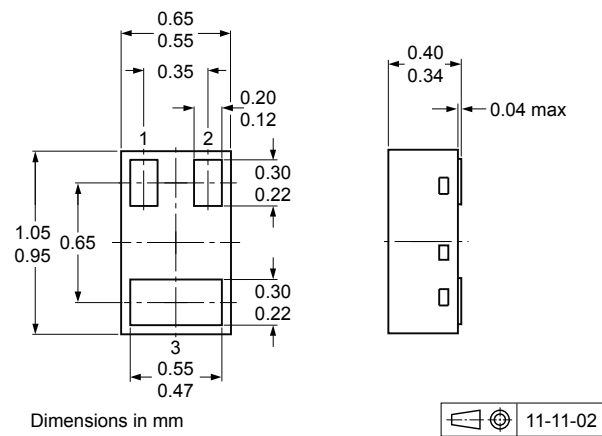


Fig. 19. Package outline DFN1006B-3 (SOT883B)

13. Soldering

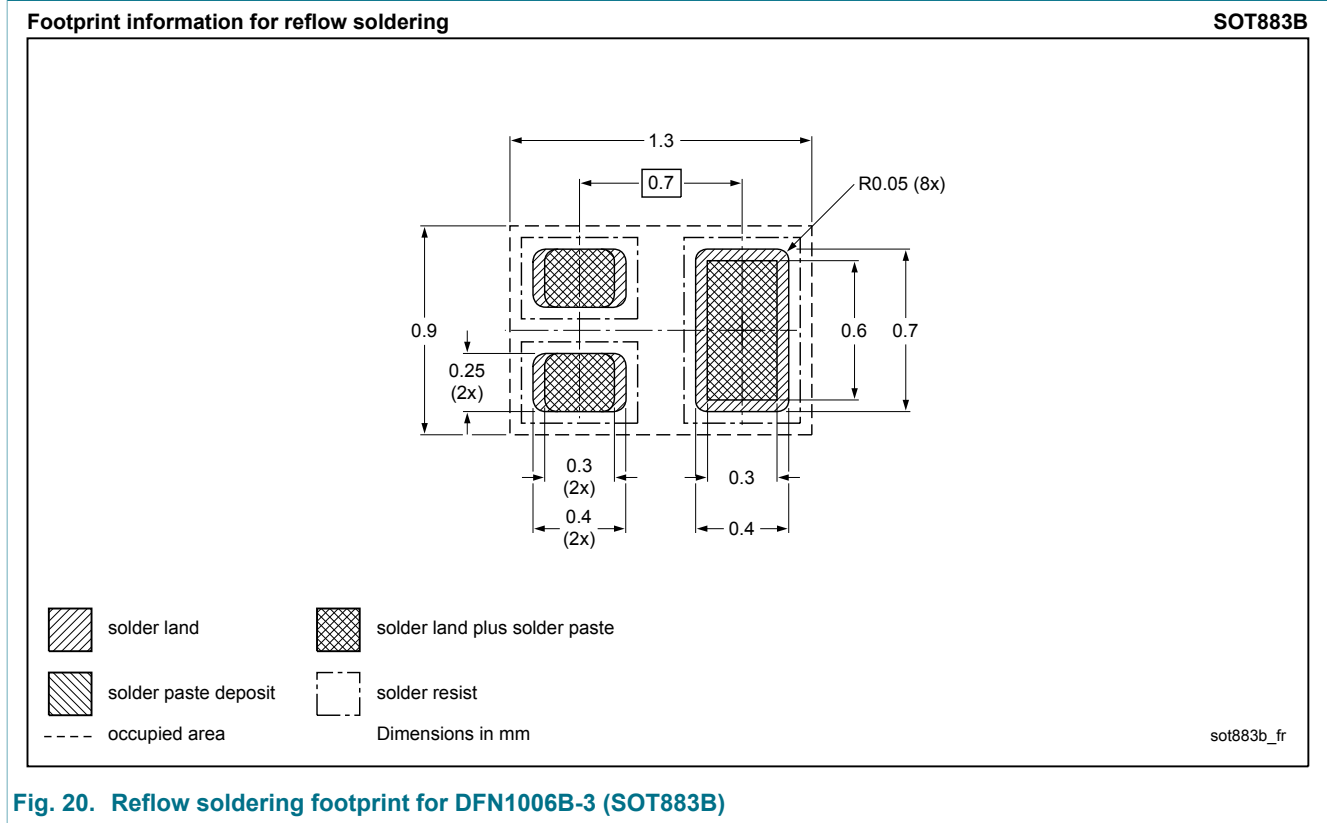


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZB290UN v.2	20160120	Product data sheet	-	PMZB290UN v.1
Modifications:	<ul style="list-style-type: none">values for gate leakage current and forward transconductance changed			
PMZB290UN v.1	20120511	Product data sheet	-	-

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15.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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